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Introduction:

As all the terrestrial planets, Venus is surrounded by an hydrogen corona coming from the photodissociation of the water vapor followed by its vertical transport at very high altitudes. From the UV observations of the resonant scattering Lyman-alpha emission, two components have been observed in this corona. A cold component corresponding to hydrogen population at equilibrium with the global atmosphere dominant below ~ 2000 km. A suprathermal component, produced by collisions between energetic protons with the cold component in the upper atmosphere. Due to its large energy, this hot population is able to reach very high altitudes, and escape and becomes dominant above ~4000 km (e.g. Bertaux et al. 1982).

Observations:

The hydrogen corona of Venus has been observed systematically from the UV spectrometer SPICAV aboard Venus Express (Bertaux et al. 2007). It has been observed at dayside, confirming most of the results obtained by past studies, and for the first time at the nightside. As shown in Fig. 1, the two components corona is seen through the two scale heights profile obtained at limb above the dayside (LT = 12H). The nightside profiles are very different due to the low illumination of the shadow by multiple scattering.

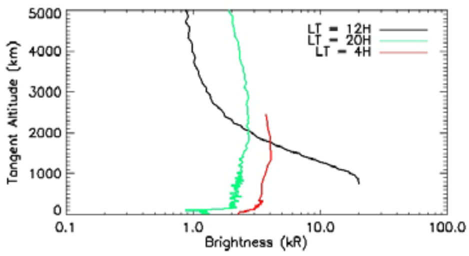

Fig. 1 Altitude profile of the Lyman-α brightness at different local times.

Results:

Chaufray et al. (2012) have analyzed the first profiles obtained at the dayside and derive a cold hydrogen density of ~1-2x10^5 cm^{-3} and an exospheric temperature ~ 250-300 K at 250 km. A larger brightness was observed at the morning terminator (LT = 6h) compared to the evening terminator (LT=18h), confirming an asymmetry observed from the mass spectrometer aboard Pioneer Venus Orbiter (PVO), but the hydrogen density needed to reproduce the profile at the morning terminator was lower than the hydrogen density derived by this instrument.

At higher altitudes, the brightness was dominated by the interplanetary emission making difficult an accurate retrieval of the hot hydrogen density. The hydrogen density derived was better constrained at the middle of the observed altitude range (~ 5000 km) and the hot hydrogen density estimated to ~50 cm^{-3}.

More recently, Chaufray et al. (2015) reproduce the first brightness profiles at the nightside evening terminator (LT = 20H), using a radiative transfer model including both cold and hot hydrogen populations as well as the interplanetary emission partly scattered by the Venusian hydrogen corona.

The cold hydrogen density and temperature of the cold hydrogen population derived at the exobase was 4x10^6 cm^{-3} and temperature between 175-225 K, confirming a cooler and denser nightside corona compared to the dayside corona. The hot hydrogen density derived at 5000 km was ~ 100 – 200 cm^{-3} larger than the derived hot hydrogen density at the dayside and presenting a very short variability of a factor 2 in only few days. This variabilty could be driven by a variation of the dayside ionosphere.

In this presentation, we will summarize these recent results and present other observations obtained at the nightside morning side (LT = 4H) (Fig; 1), confirming the large variability of the hydrogen density with local time at the nightside.

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